

Characterizing PLC-Based Servo Control Systems



Manufacturers can improve the immunity of their servo control systems.

As industrial facilities become increasingly automated, the electronic equipment controlling manufacturing processes becomes more advanced—and more sensitive to voltage fluctuations. Servo motor systems, overseen by programmable logic controllers (PLCs), are what control automated processes where precision handling of materials is required. One such process is the conveying of a product to a robotic welding arm at the split second that the arm is positioned to make contact.

Minute variations in the voltage reaching one part of a servo motor system can cause the PLC to shut down the entire system. While such shutdowns are sometimes needed to protect product quality as well as the processing equipment, they aren't always necessary. Shutdowns represent expensive disruptions to a manufacturing plant's operations, and because of this your customers are seeking ways for the electric power system to interact more compatibly with their processes.

Investigates the Response of PLC-Based Servo Control Systems to Power Disturbances

In the EPRI project, *Characterizing PLC-Based Servo Control Systems*, EPRI PEAC Corporation is exploring ways to make automated servo control systems more immune to voltage fluctuations. By participating in this Tailored Collaboration opportunity, you join forces with EPRI and your customers to investigate the causes of incompatibilities between your customer's equipment and the electric power system. You also assess the effectiveness of solutions to power quality problems and identify ways to improve the design of manufacturing equipment for improved compatibility. The project, while leveraging resources from an EPRI matching fund, offers valuable solutions to your customers.

PROJECT SUMMARY This project will draw on the input of industrial facility operators, energy service providers, and equipment manufacturers to identify power quality issues related to PLC-based servo control systems. EPRI engineers will then create performance criteria for these systems and develop guidelines for making the systems less susceptible to electrical disturbances. They will share case studies from voltage sag testing at numerous industrial facilities to help increase the general awareness of typical power quality problems. The case studies provide examples in which manufacturers have improved the immunity of their PLC-based servo control systems.

To achieve these goals, engineers in the EPRI Power Quality Test Facility will design and build a model PLC-based servo control system that reflects typical factory systems. They will run automated servo control sequences while subjecting the system to assorted power disturbances. This will allow them to demonstrate the susceptibilities of particular control schemes and develop modifications in

the programming of PLCs, while exploring the incorporation of uninterruptible power supplies. Test findings and recommended solutions will be presented in a final report and in EPRI PEAC Corp. publications.


DELIVERABLES

- Establishment of performance criteria for the response of PLC-based servo control systems to electrical disturbances
- Design and construction of a model PLC-based servo control system to test typical factory processes
- Development of testing protocols
- Testing of servo control sequences in the EPRI Power Quality Test Facility
- Case studies of voltage sag tests performed by EPRI PEAC Corp. at industrial facilities
- Final report with solutions to power quality problems identified by this project
- *Test Brief* and *Application Note* pertaining to power quality solutions for servo control systems

RETURN ON INVESTMENT As you assist your manufacturing customers with their control systems, you will be heightening their satisfaction with you as their chosen energy service provider. The performance criteria developed during this project will prove valuable for testing servo and other motor-control devices. By collaborating with the makers of PLCs, this project will help equipment manufacturers integrate circuitry that can withstand power variations into their products. Project results will also help move the manufacturing industry toward standardized performance of PLC-based servo control systems.

CONTACT INFORMATION For more information, contact the EPRI Customer Assistance Center at 800-313-3774 or askepri@epri.com.

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